PuDCaM Mobile Apps

SCOPE OF WORK DOCUMENT

V 1.0

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1. Overview

The Pupil Dilation Camera (PuDCaM) app, in collaboration with a specialized camera module, will introduce a pioneering approach to daily monitoring of pupil dilation, like heart rate monitors prevalent in today's health and wellness market. This innovative solution will be designed for both iOS and Android phones with data and support access to technicians and admins, offering universal access through seamless integration with cutting-edge hardware and sophisticated AI algorithms for precise and reliable pupil size measurements.

2. Objective

The objective of the PuDCaM app is to provide an innovative and user-friendly digital solution for daily monitoring of pupil dilation through a seamless integration with a specialized camera module Pupil Dilation Camera (PuDCaM). The IOS and Android apps aims to leverage Bluetooth connectivity and existing client-side AI-model (will be upgraded by App Maisters Team), to offer precise and reliable measurements of pupil sizes for non-medical purposes. By making this technology accessible on both iOS and Android platforms, PuDCaM seeks to enhance users' understanding and tracking of their pupillary responses over time. This app aims to find a niche where the target users can make this part of their daily regime while they're working, watching a movie, or after alcohol use and in different instances where their pupils are being impacted.

3. Functional hierarchy of the mobile apps

The functional hierarchy of the app is designed to make it easy for users to navigate and access the app's features and content as below:

- Splash screen
- Sign-in
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- First time setup
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- Analytics
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4. Functional details of the mobile apps

There will be an iOS and Android app. Once the app is ready and deployed to the app stores, the user can download the app from the Google play store for Android and the Apple app store for iOS. The app can only be logged into by users that have signed up.

4.1 Splash:

Upon tapping the app icon on the phone, the user will be presented with a Splash screen which includes the app's name and logo. This splash screen will also serve as a loading screen for the app.

4.2 Sign-In:

After the splash screen there will be a login screen which allows the user to login with their credentials. The user would login by entering their email address and password. If the login credentials are correct, they would be able to login to the app successfully. If the login credentials are incorrect, an error message will appear saying invalid username or password. There would also be a "Forgot password" and "Sign-up" link.

4.2.1 New device or device upgrade

If the user downloads the app, and signs-in on a new device they should see all their data synced from the cloud.

4.2. Forgot Password:

Upon tapping this link, a 6-digit code will be generated and sent to the user's phone number as an SMS. The user has to enter the code on the screen and submit it. After authentication, the user will be redirected to the screen where they can set up a new password.

They will be prompted to set up a unique and strong password, which should be twelve characters long, has no predictable pattern and contains a mixture of numbers, special characters and both uppercase and lowercase letters.

4.3 Sign-up

On the Sign-in screen there will be a sign-up link that when clicked will take the user to the sign up screen. On the sign-up screen a user can sign up with their Facebook, Google account or a normal email SSO sign up.

If the user chooses Facebook or Google after connecting their Google or Facebook account, the screen below will auto populate with the following fields, if the user selects Email SSO, then they must fill out the below fields, all the fields are mandatory and must be filled:

Title*: <Mr/Mrs./Miss/Ms.>

Full name:*

Email address:*

Phone number:*

"**I agree to the <Privacy policy link>***" and there will be a checkbox, checking it would indicate the user agrees and unchecking it would mean they disagree.

"**I agree to the <Terms & Conditions link>***" and there will be a checkbox, checking it would indicate the user agrees and unchecking it would mean they disagree.

Privacy policy will be a link that leads to the Privacy Policy screen (defined below under settings) and when clicked the user can read it and click back to go back to the above screen.

Terms & Conditions will be a link that leads to the Terms & Conditions screen (defined below under settings) and the user can read it and when clicked the user can read it and click back to go back to the above screen.

Then there will be a sign-up button that if tapped and if all mandatory fields have not been filled out will indicate to the user to fill those out correctly using standard error messages, so the user should fill them out and agree to the privacy policy and terms and conditions to move forward. If the user doesn't agree to the privacy policy or terms and conditions, they will not be allowed to move forward.

If the mandatory fields have been filled out correctly and the privacy policy and terms and conditions have been agreed to, when the "Sign-up" button is clicked, a 6-digit code will be generated and sent to the user's phone number via SMS. The user must enter the code on the screen and submit it. After authentication, the user will be redirected to the screen where they can set up a new password.

There will also be an option to do Email code verification instead (same as SMS verification but the code will be sent to the user's email). On successful verification and setup of password, the user is taken to the sign in screen.

They will be prompted to set up a unique and strong password, which should be twelve characters long, has no predictable pattern and contains a mixture of numbers, special characters and both uppercase and lowercase letters.

Three failures to verify the code via SMS or Email would delete the profile and the user would be told via a pop-up “Sorry there seems to problem verifying this account, the profile information has been deleted, please sign up again” and the user will be taken to the Sign-up screen. And any user information will be deleted from the app and or any database instantly so they can sign up again.

4.4 First time setup

After successfully signing up, the first time a user logs in, they are taken to the below steps screens, from Step 1 to Step 3.

In Step 1 below they will have to fill in the below fields in a form, the label of the fields and the entry mode are defined below, the heading of the screen will be “Step 1: Profile”.

4.4.1 Step 1: Profile

Date of Birth: (using date picker)

Gender by birth: Male or female drop down

Country: Country dropdown (with all countries)

City: City dropdown with all cities of that country

Race: *(below options in the drop down) there will an (i) icon that will display why this information is needed, when clicked a pop-up will display with the text below:*

"As per scientific research, race, ethnicity and certain other demographic information can influence the standard pupil measurement ranges". In the future editions of PuDCam, we hope to automate the threshold recommendations based on user's demographic information."

1. *American Indian or Alaska Native*
2. *Asian*
3. *African American*
4. *Native Hawaiian or Other Pacific Islander*
5. *Caucasian*
6. *Black African*
7. *White European*
8. *Middle Eastern or North African*
9. *Indigenous Australian or Torres Strait Islander*
10. *South Asian (e.g., Indian, Pakistani, Bangladeshi)*
11. *Southeast Asian (e.g., Filipino, Indonesian, Vietnamese)*
12. *East Asian (e.g., Chinese, Japanese, Korean)*
13. *Central Asian (e.g., Kazakh, Uzbek, Tajik)*
14. *Latin American*
15. *Caribbean*
16. *Hispanic or Latino*
17. *Other (with an optional text field for users to specify)*

Profile picture: from library camera roll, or import from Facebook (not mandatory)

Then there will be the below text on this screen:

Click here to learn about your data and what it means, and how it effects your health. You can also do this at any time within the app by clicking on the "Education <icon picture>" in the Insights section or clicking on "Education" in the menu.

The here link above will take them to the "Education" section of the app.

Then there will be the below text:

Emergency alerts allow the app to notify your emergency contacts if there is an abnormal deviation of your pupils data, we measure this deviation over a sample of data to record your average readings, if they go up or down beyond 60% your emergency contact(s) will be notified via SMS.

There will be an option to **Enable or Disable emergency alerts**. If emergency alerts are enabled then do the below, If emergency alerts are disabled, they can just click the “Next” button to move to Step 2.

Emergency contact name: text box to write full name of emergency contact. (not a mandatory field)

Emergency contact phone number: Text box with only number entry to write phone number of contact (mandatory field)

There will be a plus button that when clicked will allow the input of another Emergency contact name” and “Emergency contact phone number”, this button will disappear after being clicked once and a remove or minus link or button will appear to remove this second emergency contact name and phone number. If it is removed, then the plus would re-appear. Only one additional emergency contact name and number can be added.

After successfully entering the emergency contacts, the user can tap a “Next” button to go to Step 2 and if all of mandatory fields have been filled they would be taken to the Step 2 screens otherwise they will be shown validation error messages or the user can tap the “Skip” button to skip all of step 1 and come back to it later and be taken to the Step 2 screen.

If emergency contacts are enabled, then over the next 14 readings the average night-time and day-time readings of the user are recorded and these readings are used as a reference through the lifetime usage of the app, if there is a deviation of over or below 60% of these average night time or day time readings, then their emergency contact(s) is notified via SMS. The SMS is sent once every time a new reading above or below 60% is recorded to each emergency contact.

The content of the SMS sent will be:

“<User’s first name> has listed you as an emergency contact and their pupil measurement has seen a large deviation.”

4.4.2 Step 2: Setup Pudcam:

The heading of this screen will be “Step 2: Setup Pudcam” and it will show a mix of pictures and text like a user manual to allow the user to setup the hardware. This screen can be described as a virtual image tour of the device that will allow the user to understand the basic setup steps.

<The device should be ready by October after which the virtual image tour will be available>

The user can tap a “Next” button to go to Step 3 and they would be taken to the Step 3 screen .

4.4.3 Step 3: Setup the app with Pudcam:

The heading of this screen will be “Step 3: Setup the app with Pudcam” and it will show a mix of pictures and text like a user manual to allow the user to setup the app with Pudcam. This screen can be described as a virtual image tour of the device that will allow the user to understand the basic setup steps.

The user can tap a “Finish” button to finish and if they did not skip Step 1, they would be taken to the confirmation screen which would have some congratulations graphics and say:

“Thank you for setting up the app, you are now ready to use the Pudcam device”

And there will be an “OK” button.

If they skipped step 1, they’ll see the below screen:

“The app and the device work best when your profile is fully setup, please go into settings and profile to complete setup”

And there will be an “OK” button.

In both scenarios above, when the user clicks the “OK” button they are taken to the Dashboard screen.

4.5 Bluetooth connection with Pudcam device:

The Pudcam mobile app works with the Pudcam device, and they connect to each other via Bluetooth. The mobile app should automatically indicate to the user to switch on the phone's Bluetooth on ASAP.

There should also be a visual indicator in the app to show the status of the Bluetooth connection (connected, disconnected, connecting, preferably by intuitive icons).

4.5.1 First-time connect

When the user reaches the Dashboard screen for the first time the mobile app should in the background automatically start connecting to a Pudcam device for the first time and begin pairing, with minimal user input. If the Pudcam device is not discoverable or the mobile app's bluetooth is switched off (even after indication) then nothing would happen and the user will not be notified until they do something that requires a bluetooth connection or try to manually connect the device in the "Device" section. If the phone's bluetooth is switched on and the mobile app is open, the mobile app will continue to discover and connect with a nearby Pudcam device in the background.

If the mobile app finds more than 1 Pudcam device, then a menu with the names of all the Pudcam devices would display and the user should be able to choose which device to connect.

Upon successful connection, the mobile app should stay connected to the device while it is open, the bluetooth connection should stay active while the mobile app is open. It can disconnect when the mobile app is closed to preserve the phone and the Pudcam device's battery life.

4.5.2 Reconnection cycle

The mobile app and Pudcam device should begin connecting automatically in the background as soon as the mobile app is re-opened. The mobile app should try to discover and connect to the previously connected Pudcam device while the mobile app is open continuously and should by default reconnect to a previously connected device.

If it finds more than 1 Pudcam device or a different PudCam device, then a menu with the names of all the Pudcam devices would display and the user should be able to choose which device to connect. If the user selects a different device from the previously connected one, then it should connect to the new one and make that the preferred reconnection device. Upon successful connection, the mobile app should stay connected to the device while it is open, the bluetooth connection should stay active while the mobile app is open. It can disconnect when the mobile app is closed to preserve the phone and the Pudcam device's battery life.

4.6 New App session

After every 24 hours whenever a new session on the app is initiated (the mobile app is opened), the mobile app will check for updated AI weight files and Firmware updates (if automatic firmware updates are enabled).

4.6.1 AI Weight files

Every 24 hours or more when a new session on the app is initiated, the mobile app, will ping a designated URL to check for updates on the latest weight file version of the AI model.

- If an update exists, the mobile app will automatically download and install the updated file to replace the current file.
- If no update file exists, the app will utilize the current version of the weight file.

The user will see an "Updating the AI model of the app" pop-up message until it completes successfully. The update process should have a roll back fail safe method that if something fails in the updating it goes back to the previous weight file and it should only update to the newest file,

4.6.2 Firmware update

Every 24 hours or more when a new session on the app is initiated, the mobile app, will ping a designated URL to check for updates on the firmware version.

If a new version of the firmware exists it would begin to download automatically and be saved to the mobile app. If no new firmware exists, nothing happens.

The Pudcam device would be uploaded a new firmware update when it's charging or has battery health above 50%, if the firmware update is pushed and downloaded onto the Pudcam device, the device would then begin to install it after internal checks pass and then resets the Pudcam device to use with the new firmware.

If automatic updates is not enabled, then the user would get a notification, that a new firmware is available and has been downloaded, and if they press the update button the device would begin downloading and updating the firmware. During the firmware update process the device would disconnect from the app and the reconnect after resetting. The entire firmware update process should not need the mobile app or the device to be connected to the internet after the new firmware has successfully downloaded.

4.7 Image Transfer

If there is a successful bluetooth connection with the Pudcam device and the user captures an eye image using the Pudcam device, the device will tell the mobile app that a new picture is available and begin sending that picture to the mobile app and then the picture processing begins (detailed below).

If a bluetooth connection is not active the Pudcam device will keep the images until a bluetooth connection is made with the device, all pictures taken that are not already shared to the mobile app will begin uploading to the mobile app from the Pudcam device and then as soon as pictures have successfully downloaded the picture processing begins (detailed below). In the case of one single image capture being done on the device, as soon as one picture is successfully captured, it can begin uploading to the mobile app and after successful upload, the picture processing begins.

4.8 Picture processing

Once the image is received by the mobile app there will be a duplicate copy of the picture made and the duplicate copy will be uploaded to the cloud, AI processing will begin on the local copy and once pupil measurement has been made successfully, the local copy of the picture will be deleted. If an internet connection is not there and the picture is not sent to the cloud, then a local copy will not be deleted and will remain available for the user to view. When an internet connection is active, the successful pupil measurement will be sent to the cloud database, with the AI ML version, app version, time and date, nighttime or daytime flag and a copy of the image will be sent to the cloud and the local copy deleted.

AI module processes the image by measuring the pupil dilation. This measurement is then recorded for that picture that was just taken. The measurement is then available within the mobile app's features defined below.

4.9 Dashboard (default screen)

This will be the default selected screen when the user opens the app, signs in, and reaches in after first time sign up. This is the screen the user would land on by default. The design and layout of this screen will be similar to the Apple Health app summary tab.

4.9.1 Notification cards

The user will see 2 highest priority notifications as notification cards (designed like the Apple health app) and if a “View more” link is clicked they’ll be taken to the notifications screen. Notifications will be defined in to high, medium and low priority and 2 new notifications of highest priority would display as a card with a total count on the top right corner and if for e.g. There are no notifications or there is only one notification the section below would move up to fill the space. If there are no new notifications, there would be no cards and as a card is closed the sections below would move up to fill the space (like the Apple health app).

4.9.2 Trends

There would be a “Trends” heading and then a menu under it (designed same as the Apple health app), would show different trend options as below, the menu would be fixed and if there’s no data (no eye readings have taken place) it would say “No data available as yet”

4.9.2.1 All Trends

There would only be one menu option for now under “Trends” called “All trends” with a right arrow (similar to Apple health’s “Show all Health trends”) when tapped would take the user to the “All trends” screen. This screen would have Trending and Non-trending headings, and there would be cards under each heading with an graph of (daily, weekly, monthly or yearly whichever is highest) on each if there is trending (data in the last 48 hours) or non- trending data (no data in the last 48 hours), use the y-axis and x-axis for each filter as described in the heading below.

4.9.2.1.1 Graph Filters for y-axis and x-axis

For daily graph, time would be on the x-axis and reading on the y-axis.

For week, the day of the week on the x-axis and the average reading on the y-axis.

For month, the month number on the x-axis and the average reading on the y-axis,

For 6 months, month name on the x-axis and average reading on the y-axis.

For year, letter of month on the x-axis and the average reading on the y-axis.

Even if 6 months or a year's data is not yet available, a bar graph should generate with whatever data is available in those filters.

Trending

Under the "Trending" heading, a graph would be generated showing the largest filtered bar graph (day, week, month, 6 month or year) on the card of readings of the user. If the previous 48 hours have just been night time (after sunset and before sunrise) readings then there would also be a card under "Trending" with a heading called "Night Time" with a bar graph of the last 7 night time readings (date in the x-axis and reading on the y-axis) and if the previous 48 hour readings have just been day time readings (after sunrise and before sunset) there would be a heading called "Day time" with a bar graph of the last 7 day time readings (date in the x-axis and reading on the y-axis).

If there is no trending data (any data in the last 48 hours) then it would say "None" under the "Trending" heading.

When a "Trending" card/graph is tapped a new screen would open and the user would see a by day filtered graph by default, with the ability to filter the graph by day, week, month, 6 months and year (like the Apple health app).

When a "Night time" card/graph under "Trending" is tapped a new screen would open and the user would see a by day filtered graph by default with the ability to filter the graph by day, week, month, 6 months and year (like the Apple health app) of their night-time readings (after sunset to sunrise).

When a "Day time" card/graph under "Trending" is tapped a new screen would open and the user would see a by day filtered graph by default with the ability to filter the graph by day, week, month, 6 months and year (like the Apple health app) of their day-time readings (after sunrise to sunset).

And there should be “Share” button or link where the user should be able to share the generated graph as an image to connected social media accounts, along with defined auto generated text that would be “ Pupil size measurements can help understand several underlying disease conditions. I’m tracking my pupil dilations with PuDCam. #PuDCam #pupillarysizes #EyeHealth"”. This text and the generated graph picture should then post to the social media account.

Non-Trending

A graph would be generated showing the largest filtered bar graph (day, week, month, 6 month or year) on the card of readings of the user, there would also be a card under “Non-Trending” with a heading called “Night Time” with a bar graph of the last 7 night time readings and there would also be a heading called “Day time” with a bar graph of the last 7 day time readings.

Non-trending graphs would be updated and generated even if the readings are trending, so the user can come under these headings and view all their data.

When a “Non-Trending” card/graph is tapped a new screen would open and the user would see a by day filtered graph by default, with the ability to filter the graph by day, week, month, 6 months and year (like the Apple health app).

When a “Night time” card/graph under “Non-Trending” is tapped a new screen would open and the user would see a by day filtered graph by default with the ability to filter the graph by day, week, month, 6 months and year (like the Apple health app) of their night-time readings (after sunset to sunrise).

When a “Day time” card/graph under “Non-Trending” is tapped a new screen would open and the user would see a by day filtered graph by default with the ability to filter the graph by day, week, month, 6 months and year (like the Apple health app) of their day-time readings (after sunrise to sunset).

And there should be “Share” button or link where the user should be able to share the generated graph as an image to connected social media accounts, along with defined auto generated text that would be “ Pupil size measurements can help understand several underlying disease conditions. I’m tracking my pupil dilations with PuDCam. #PuDCam #pupillarysizes #EyeHealth"”. This text and the generated graph picture should then post to the social media account.

4.9.3 Highlights

In the highlights section heading on the Dashboard screen, some highlights will be generated due to pre-defined conditions of the user's data over time with a corresponding graph. This will be the third and last section heading on the dashboard screen and if no highlight conditions are met, the user would not see this heading and any data in this section.

The conditions that generate these highlights would be:

4.9.3.1 Increase of pupil dilation percentage over 3 days or more:

If a user reaches 3 days of pupil dilation increase and does not open the app, there would be a bar graph generated under the heading "Increase of pupil dilation over 3 days" in the Highlights section showing this increase for the first 3 days of this condition, with the date on the x-axis and the reading on the y-axis and it would keep incrementing with 3 more days of data every 3 days (even if the condition is not true anymore) until the user opens the app. After every 3 days the user would also receive a new notification about this highlight (see notifications section). If there is more than 1 reading per day, the average reading for that day will be on the x-axis.

4.9.3.2 Decrease of pupil dilation percentage of 3 days or more.

If a user reaches 3 days of pupil dilation decrease and does not open the app, there would be a bar graph generated under the heading "Decrease of pupil dilation over 3 days" in the Highlights section showing this decrease for the first 3 days of this condition, with the date on the x-axis and the reading on the y-axis and it would keep incrementing with 3 more days of data (even if the condition is not true anymore) every 3 days until the user opens the app. After every 3 days the user would also receive a new notification about this highlight (see notifications section). If there is more than 1 reading per day, the average reading for that day will be on the x-axis.

4.9.3.3 Streak of data recording of 3 readings

If a user does 3 separate pupil dilation readings and does not open the app, there would be a bar graph generated under the heading "Last <x> readings" in the Highlights section showing the last 3 readings of the user, with the date on the x-axis and the reading on the y-axis and it would keep incrementing with 3 more readings of the user until the user opens the app, the heading of this highlight would update after every 3 readings, updating the <x> value. Every time the graph would update with 3 more readings the user would also receive a new notification about this highlight (see notifications section). If there is more than 1 reading per day, the average reading will be on the x-axis.

4.9.3.4 Streak of data recording of 3 or more for night time

If a user does 3 separate pupil dilation readings after sunset to sunrise of their local time zone and does not open the app, there would be a bar graph generated under the heading “Last <x> Night time readings” in the Highlights section showing the last 3 readings of the user, with the date on the x-axis and the reading on the y-axis and it would keep incrementing with 3 more readings of the user until the user opens the app, the heading of this highlight would update after every 3 readings, updating the <x> value. Every time the graph would update with 3 more readings the user would also receive a new notification about this highlight (see notifications section).

4.9.3.5 Streak of data recording of 3 or more for day time

If a user does 3 separate pupil dilation readings after sunrise to sunset of their local time zone and does not open the app, there would be a bar graph generated under the heading “Last <x> Day Time readings” in the Highlights section showing the last 3 readings of the user, with the date on the x-axis and the reading on the y-axis and it would keep incrementing with 3 more readings of the user until the user opens the app, the heading of this highlight would update after every 3 readings, updating the <x> value. Every time the graph would update with 3 more readings the user would also receive a new notification about this highlight (see notifications section).

4.10 Insights

This would be the second screen available to the user after the Dashboard screen (as an icon on the app). This screen would have all the data of the pupil dilation readings taken from the Pudcam device. .

There will be three headings or tabs on this screen one is “Table”, one is “Graph” and one is “Raw Images”, the first two will allow the viewing and exporting of the user’s pupil dilation reading data recorded from the device. The third will allow the viewing of their image captures, saving them or sharing them.

4.10.1 Readings

This section or tab will have a table and by default there would be the previous 30 readings with the column names, date, time, pupil dilation. The nighttime readings would be a grey shade and the daytime readings would be just white. The normal pupil dilation range legend should be on this screen, 4mm to 8mm somewhere on the top right corner. There should be an ability to generate table results by set number of days such as 30, 60, 90 days and/or by using a date picker from the day the first reading was recorded until today, once the date is selected and the user clicks the ”OK” button, table data should generate with all the readings for the days selected. The user should be able to select how much data can be displayed on the table, between, 30, 50 and 100 results. There should be the ability to export the generated table in a PDF or CSV format, there should be a link or button to export the table to a PDF and a separate link or button to export the table to a csv file. Upon clicking the button the PDF or CSV file should begin downloading to the mobile device.

4.10.2 Graph

This section or tab will have a bar graph and by default it would show the previous 30 readings with the date on the y axis and the average pupil dilation for that day on the x axis. There should be ability to generate the bar graph by using a date picker from the day the first reading was recorded until today. When the user selects the date “from” and “to” from the date picker and clicks an “OK” button, they should then see the bar graph that generates for those dates, depending on the “from” to “to” selection, the x-axis and y-axis can be presented by the filtered x & y axis assigments in the trending section (see heading “Graph Filters for y-axis and x-axis"). There should be a link or button to export this graph to a PDF file. And there should be “Share” button or link where the user should be able to share the generated graph as an image to connected social media accounts, along with defined auto generated text that would be “Pupil size measurements can help understand several underlying disease conditions. I’m tracking my pupil dilations with PuDCam. #PuDCam #pupillarysizes #EyeHealth”.

4.10.3 Raw Images

There will be a section or tab called “Raw images”, this section will display all the images captured by the device (and sent to the mobile app successfully), like an iOS pictures album that is sorted by date. These pictures are not stored on the device or the mobile app but stored on the cloud and the thumbnail data is downloaded to view for the user when they open this section, when the user clicks on a picture the picture is then opened in a web viewer downloaded from the cloud and the user has the option to save it to their phone or share it. The user should be able to see all the pictures they ever took with their Pudcam device in this section, view each picture, save them or share them. The pictures should be sorted by date and grouped by week, month and then year.

There will also be an option to bulk download the images by a link called “Bulk download” when tapped, the user is asked if they want to download images from today, this week, this month, this year or for all time. After making their selection, the user is asked to verify their password and once verified the user will receive an email with a link to download the images for the time selected.

If the user’s password does not verify, they cannot download the images and the operation cancels.

4.11 Education

<Will also be icon available throughout the insights section and an option in the app menu>

This screen would educate the user in using the Pudcam device and the mobile app. There would be a list of links (all the headings below), when tapped the user is taken to a new screen with the content and text for that heading.

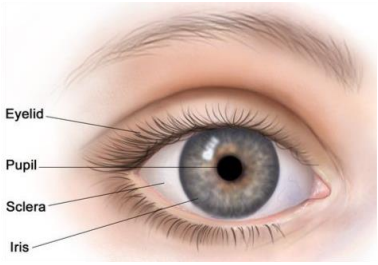
The section is editable by the admin on the admin panel, however it should still be available for the user to view offline, essentially it should only update when an internet connection is available, otherwise not.

4.11.1 Science behind Pudcam

4.11.1.1 Biological Definitions with authenticated sources:

National Cancer Institute

The round opening in the center of the iris (the colored tissue that makes the "eye color" at the front of the eye). The pupil changes size to let light into the eye. It gets smaller in bright light and larger as the amount of light decreases.



DIAMOND JPThe Pupil. Anatomy, Physiology and Clinical Applications. British Journal of Ophthalmology 2001;85:121.

- Pupil Definitions, Textbook

Spector, R. H. (1990). The Pupils. In H. K. Walker (Eds.) et. al., Clinical Methods: The History, Physical, and Laboratory Examinations. (3rd ed.). Butterworths.

- "The normal pupil size in adults varies from 2 to 4 mm in diameter in bright light to 4 to 8 mm in the dark. The pupils are generally equal in size. They constrict to direct illumination (direct response) and to illumination of the opposite eye (consensual response). The pupil dilates in the dark. Both pupils constrict when the eye is focused on a near object (accommodative response). The pupil is abnormal if it fails to dilate to the dark or fails to constrict to light or accommodation."

4.11.1.2 PuDCam working principle (IR based capture, only summary):

4.11.1.3 Additional information about Pupil Dilation, relation with other underlying disease conditions, intrinsic indicators of comorbidity, etc.,

Example content by Vamsi:

Eye Health Information:

- ***Pupil Dilation and Constriction:*** *"The pupil is the black circle in the center of the eye that controls the amount of light entering. Pupil dilation refers to the widening of the pupil, which occurs in dim light or when the eye is stimulated. Constriction, on the other hand, is the narrowing of the pupil, which happens in bright light or when focusing on near objects."*

Eyewear Information:

- ***Impact on Pupil Size:*** *"Certain eyewear, such as sunglasses with tinted lenses, can affect pupil size. In bright light, pupils naturally constrict to reduce the amount of light entering the eye. Tinted lenses can help in this process by reducing the overall brightness and allowing for more comfortable vision in bright conditions."*

Integration with Pupil Dilation Feature:

- ***Importance of Pupil Size Measurement:*** *"Measuring pupil size can provide valuable information about the health of the eye and the body's autonomic nervous system. Changes in pupil size can indicate neurological conditions, drug effects, or even emotional responses."*

A] Normal Pupil Diameter in bright and dim light environments:

The normal pupil size in adults varies from 2 to 4 mm in diameter in bright light to 4 to 8 mm in the dark [1]. The pupils are generally equal in size. They constrict to direct illumination (direct response) and to illumination of the opposite eye (consensual response). The pupil dilates in the dark. Both pupils constrict when the eye is focused on a near object (accommodative response). The pupil is abnormal if it fails to dilate to the dark or fails to constrict to light or accommodation.

B] Effects on pupil size due to consumption of various drugs:

I] Cannabinoids: The active compound is tetrahydrocannabinol (THC), and route of intake can be smoking or oral ingestion [2]. The effects of smoked cannabinoid begin within minutes and usually last for 1-3 h. It leads to euphoria, short attention span and red eyes. With oral ingestion, concentration peaks occur at about 1-3 h. Cannabis intake leads to conjunctival injection, dilated pupils, reduced accommodation amplitude and impaired oculomotor function in chronic users.

II] Opiates: Opiates include numerous substances such as morphine (naturally occurring), heroin (semisynthetic), meperidine and methadone (synthetic derivatives) and prescription opioids including hydrocodone, oxycodone, pentazocine and fentanyl [2]. These drugs act through the opioid receptors μ, κ, δ, and cause a decrease in the pupillary size and in the velocity of constriction to light stimulus, and dilatation after the light stimulus is removed. The effect usually starts in 15-60 min and lasts for 3-5 h.

III] Cocaine: Cocaine can be ingested orally, and combined opioid and cocaine abusers, use it as intravenous injection [2]. It is often used with alcohol. With freebase inhalation, effects occur within 4-6 sec and lasts for 5-7 min only. When the powder is sniffed, effects are produced within 1-3 min and last for about 30 min. Cocaine causes dilated pupils because of inhibition of reuptake of norepinephrine.

IV] Methamphetamine: It increases the production of dopamine in the brain and activates reward centers of the brain giving a sense of euphoria soon after taking the drug and causes aggressiveness, anxiety and dilated pupils [2].

V] Cyclazodone (n-cyclopropylpemoline): It is a novel stimulant drug which produces stimulating and focus-enhancing effects similar to dexamphetamine by increasing release of dopamine, noradrenaline and serotonin [2]. Its ocular and visual effects are less consistent and usually occur

at higher doses in the form of pupillary dilatation and brightness alterations which manifest as change in the level of perceived brightness *i.e*., surroundings may appear darker and gloomier or brighter.

VI] 4-Methylaminorex: It is a stimulant drug with its action similar to amphetamine and available in powder and tablet forms [2]. The unwanted effects include agitation, nausea, tachycardia, restlessness and dilated pupils.

VII] Prescription stimulants: Prescription stimulants include amphetamines, methylphenidate for attention-deficit hyperactivity disorder and nasal decongestants such as pseudoephedrine, phenylephrine, promethazine, phenylpropanolamine and oxymetazoline [2]. These drugs can also be abused/misused, and drug effects on eye can occur in the form of pupil dilatation and precipitation of angle-closure glaucoma in predisposed individuals with narrow angles.

VIII] Hallucinogens: This group includes lysergic acid diethylamide (LSD), psilocybin, phencyclidine (angel dust) and mescaline [2]. These drugs can cause hallucinations, recklessness, sleeplessness, slurred speech, hyperarousal of the central nervous system (CNS), loss of coordination and pupil dilation.

IX] Methaqualone: It is a CNS depressant with sedative-hypnotic action on gamma aminobutyric acid (GABA) A receptor and is used for insomnia [2]. Pupil size and reaction usually are not affected, but dilated pupils can occur at very high doses.

C] Table 1: Summary of effects of abusive drugs on ocular motility and pupil [2]

Ocular adverse effects	Marijuana	Narcotic analgesics	Hallucinogens	CNS depressants	CNS stimulants	Phencyclidine
Pupils	Dilated/normal	Constricted	Dilated	Normal	Dilated	Normal
Pupillary reaction to light	Normal	Slow/none	Normal	Slow	Slow	Normal
HGN	Not present	Not present	Not present	Present	Not present	Present
VGN	Not present	Not present	Not present	Possibly present	Not present	Usually present
Lack of ocular convergence	Present	Not present	Not present	present	Not present	Present

CNS, central nervous system; HGN, horizontal gaze nystagmus; VGN, vertical gaze nystagmus *Source*: Refs [54,62,66,103]

Koehler, P. J., & Wijdicks, E. F. M. (2015). Fixed and dilated: the history of a classic pupil abnormality. Journal of Neurosurgery JNS, 122(2), 453-463. https://doi.org/10.3171/2014.10.JNS14148

- Information about scenarios and illnesses that lead to pupil dilation
- “Along with bradycardia and motor and respiratory effects, he noticed wide pupils were usually present in a comatose state. Asymmetrical dilation could not always be attributed to increased ICP, but to an oculomotor nerve lesion.”

- “pupil constriction by bulbar lesions, due to CSF shock, followed by dilation from congestion and inflammation, due to blood around the oculomotor nerve.”

Sheppard AL, Wolffsohn JSDigital eye strain: prevalence, measurement and ameliorationBMJ Open Ophthalmology 2018;3:e000146. doi: 10.1136/bmjophth-2018-000146

- Pupil diameter has been found to be related to visual fatigue in digital screen usage.
- Increased pupil diameter is indicative of visual fatigue in tracking and high ocular speed tasks (i.e., gaming).
- Constricted pupils have been observed both during and even after intense tasks (i.e., reading, writing, research) on larger displays (not smartphones), as a sign of eye strain (caused by pupil muscle spasms).

4.11.2 Relevance to light

Barbur, J.L. (1995). A Study of Pupil Response Components in Human Vision. In: Robbins, J.G., Djamgoz, M.B.A., Taylor, A. (eds) Basic and Clinical Perspectives in Vision Research. Springer, Boston, MA. https://doi.org/10.1007/978-1-4757-9362-8_1

- Pupil Reflexes and Responses
- “pupils continue to respond normally to sudden changes in room illumination even when the patients are corticaliy blind”
- “The pupil diameter follows an almost linear relationship when plotted as a function of the logarithm of retinal illuminance over a wide range.”

Prakash Adhikari, Andrew J. Zele, Beatrix Feigl; The Post-Illumination Pupil Response (PIPR). Invest. Ophthalmol. Vis. Sci. 2015;56(6):3838-3849. https://doi.org/10.1167/iovs.14-16233.

- Pupil light responses as a diagnostic tool

4.11.3 Deviations in my results

4.11.4 What’s a normal range for me

MacLachlan, C. and Howland, H.C. (2002), Normal values and standard deviations for pupil diameter and interpupillary distance in subjects aged 1 month to 19 years. Ophthalmic and Physiological Optics, 22: 175-182. https://doi.org/10.1046/j.1475-1313.2002.00023.x

- Normal Pupil Sizes, Children
- “(males PD=43.36 + 1.663*age in years – 0.034*age in years2, r2=0.986; females PD=41.76 + 1.891*age in years – 0.052*age in years2, r2=0.986)”

Y. Li, D. Huang; Pupil Size and Iris Thickness Difference Between Asians and Caucasians Measured by Optical Coherence Tomography. Invest. Ophthalmol. Vis. Sci. 2009;50(13):5785.

- Asians have bigger pupil diameters than Caucasians, higher glaucoma risk

Couldn't find much data on African/African American population

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References:

[1] Spector RH. The Pupils. In: Walker HK, Hall WD, Hurst JW, editors. Clinical Methods: The History, Physical, and Laboratory Examinations. 3rd edition. Boston: Butterworths; 1990. Chapter 58. Available from: https://www.ncbi.nlm.nih.gov/books/NBK381/

[2] Dhingra D, Kaur S, Ram J. Illicit drugs: Effects on eye. Indian J Med Res. 2019 Sep;150(3):228-238. doi: 10.4103/ijmr.IJMR_1210_17. PMID: 31719293; PMCID: PMC6886135.

4.12 Device

This would be the third main screen available to the user after the Dashboard screen and Insights screen. This screen would have all the device related functions, this screen would be laid out with large square menu links with icons and labels. Each of the headings below would be a menu button or link.

By default when a Pudcam device is switched on and the user's mobile app is open with Bluetooth switched on – it should begin connecting or reconnecting to that device. Upon first time connection, the mobile app should confirm the device and connect to it. A previously connected device should auto connect instantly,

4.12.1 Connect Device

There would be a connect device large menu button with the color and the current status of the device connection. When this button is clicked, if the device is connected to the mobile app, a pop-up would show and it should have the status of the connection and how long its been connected and the name of the device it's connected to.

First-time connect

When the button is clicked if there is disconnection, and if the device is connecting for the first time, a Pudcam device with Bluetooth switched on and the mobile app with the phone's Bluetooth switched on should begin connecting for the first time and begin pairing, with minimal user input. If the mobile app's Bluetooth is switched off, it would throw an error alert, if a Pudcam device is not discoverable then the mobile app will throw an error alert (error alert section below). And it would stop retrying to connect until the user clicks on "Connect Device" button again.

User reconnects

If the Pudcam device is disconnected after being previously connected to the mobile app and before it could auto-connect successfully the user taps the "Connect device" button, then the mobile app would try for a reconnection and it should show a pop-up saying "Trying to detect nearby Pudcam devices, please make sure the device is nearby and switched on for it to connect successfully".

And the mobile app would look for nearby Pudcam devices with Bluetooth switched on, it should by default reconnect to a previously connected device, however if it finds more than 1 Pudcam device or a different Pudcam device, then a menu with the names of all the Pudcam devices would display and the user should be able to choose which device to connect. If the user selects a different device from the previously connected one, then it should connect to the new one and make that the preferred reconnection device.

If the mobile app is discovering nearby devices, the pending pop-up message would display and the mobile app would look for nearby devices for <an industry defined prescribed time> and the pop-up would show an animation of trying to find nearby Pudcam devices, if no device is found for the prescribed time, it would ask the user in a new pop-up if they would like to retry device connection or cancel. Cancelling it would take the icon into a disconnected state until manually asked to connect.

Retrying would start the connecting to device cycle again. Once a connection is established successfully then any time the device is disconnected, it should begin the auto reconnect cycle again.

4.12.1.1 Errors (in-app alerts):

- Device Not Found:
    - Pop-up Title: Unable to Find Device
    - Pop-up Text: Please make sure your PudCam device is nearby and switched on with Bluetooth enabled.
- Bluetooth Switched Off:
    - Pop-up Title: Bluetooth Switched Off
    - Pop-up Text: Please enable Bluetooth on your device to connect to your PudCam device.
- Bluetooth Disconnected:
    - Pop-up Title: Bluetooth Disconnected
    - Pop-up Text: The Bluetooth connection to your PudCam device has been lost. Please ensure your device is nearby and try reconnecting.
- Pending Connection Timeout:
    - Pop-up Title: Connection Timeout
    - Pop-up Text: The connection to your PudCam device has timed out. Would you like to retry connecting?
- Multiple Devices Found:
    - Pop-up Title: Multiple Devices Found
    - Pop-up Text: Multiple PudCam devices have been detected. Please select the device you want to connect to.

4.12.2 Virtual Remote

This would also be a large menu button just like “Connect device”. It would take the user to a new screen that would allow the virtual controls of the Pudcam device, the user should be able to:

- *Capture:* A message will display for 4 seconds that says: “You have 5 seconds to place the Pudcam device against your eyes and don’t blink for 3-5 seconds”, this virtual button will emulate the device’s capture button and trigger the capture function on the device.
- *Reboot*: This would switch the device off and then on again.
- *Erase data:* There will be an explanation that all your data from the device will be removed and reset. When the user clicks this link they are asked: “Are you sure, you want to delete all your device data? After the user clicks “OK”. Then a pop-up asks for their current password after the password is entered successfully, an SMS is sent to their phone with a verification code and a pop-up is shown that says “An SMS has been sent to the registered phone number with a one-time passcode, please enter it below to continue” and the user must enter the code sent to their phone, if the code is entered successfully, the data deletion process begins and the user is show a progress bar, after completion all the data on the device should be deleted. If the password or the SMS verification fails 3 times, the operation is canceled.
- *Reset device:* If this is tapped, the device would reboot and the same firmware would be reinstalled and the device would reboot again for the user.
- *Reset to factory default:* would trigger “Erase data” above and then “Reset device” above.
- *Turn off:* Clicking off would turn off the Pudcam device
- *Turn on:* Clicking on would turn on the Pudcam device.

The above screen should ideally look like a remote control with buttons and icons.

4.12.3 Battery health

This would also be a large menu button just like “Connect device” but it would not be clickable. The button would show the percentage of remaining battery of the connected PudCam device, there would be a picture of a battery which would graphically display the remaining percentage and the remaining percentage number would be displayed with it. If a Pudcam device is not connected, it would say “Device not connected” and a disconnected battery graphic would display, if a Pudcam device is charging it would say “PudCam device is charging” and the charging battery graphic would display.

Information sharing between the device and the mobile app about the battery health of the device should not require an internet connection.

If the Pudcam device battery goes below 20% they should get the “Low Battery” defined below. If the Pudcam device battery goes below 10% they should get the “Critical Battery” alert defined below.

4.12.3.1 Errors (in- app alerts):

- Low Battery:
    - Pop-up Title: Low Battery
    - Pop-up Text: Your PudCam device's battery is running low. Please recharge it soon to continue using the device.
- Critical Battery:
    - Pop-up Title: Critical Battery
    - Pop-up Text: Your PudCam device's battery is critically low. Please recharge it immediately to avoid losing data.

4.12.4 Troubleshoot

This screen would have a list of links below which would lead the user to the relevant screen.

The first link would be “Setup hardware device” - This would lead the user to the “Step 2” screen from the first-time setup. That screen would display and if the user clicks back, they are brought back to the “Troubleshoot” screen.

The second link would be “Setup the app to work with device” - this would lead the user to the “Step 3” screen from the first-time setup. That screen would display when this link is clicked and if the user clicks back, they are brought back to the “Troubleshoot” screen.

4.12.4.1 Calibrate Device

The third link will be “Calibrate device” if the recorded image captures are continuously being rejected by the AI model or the mobile app as invalid or incorrectly captured, the user may want to calibrate the device.

When the user clicks this link, the camera library will be reset and the user will be told “Please put camera part near the camera” and a picture of the text on the part will be taken, the user would then be shown the ideal picture on the screen compared to their taken picture on screen and asked if these look 50% or 100% the same?

If they say 50%, then we refresh the camera library and then say “Please put camera part near the camera” and a picture of the text on the part will be taken, the user would then be shown the ideal picture on the screen compared to their take picture on screen and asked if these look 50% or 100% the same? If the use enters 50% again they are then told “Please contact customer support”

If the user selects 100% then they are told “The Pudcam has successfully calibrated” and the user can tap “OK” to go back. The device calibration activity should not require an internet connection and should be able to take place between the device and the mobile app without the internet.

4.12.4.2 Help with Device

The fourth link would be “Help with Device” when clicked would open a new screen which would have a list of the most common questions and their answers. The user would see a list of the most common questions and under it would show the answers (below the question or in some other user-friendly way).

The section is editable by the admin on the admin panel, however it should still be available for the user to view offline, essentially it should only update when an internet connection is available. We also have video tutorials that cover most of these questions and answers.

1. How do I pair my PuDCam device with the mobile app?
    a. Answer: To pair your PuDCam device, ensure Bluetooth is enabled on your mobile device and open the PuDCam app. Follow the on-screen instructions to complete the pairing process. We also a video that demonstrates this process.

2. What should I do if my PuDCam device is not recognized by the app?
    a. Answer: If your PuDCam device is not recognized, try restarting the app and ensuring that Bluetooth is enabled on both devices. If the issue persists, contact customer support for assistance.

3. How do I charge my PuDCam device?
    a. Answer: To charge your PuDCam device, connect the provided charging cable to the device and a power source. The app will indicate when the device is charging.
4. Can I use my PuDCam device while it's charging?
    a. Answer: Yes, you can use your PuDCam device while it's charging. However, please note that the charging process may take longer if the device is in use.
5. How do I know if my PuDCam device is powered on?
    a. Answer: The PuDCam device's green LED indicator will be illuminated when the device is powered on. If the LED is off, the device is powered off.
6. What does the blinking blue LED on my PuDCam device indicate?
    a. Answer: The blinking blue LED indicates that the device is currently capturing an image. Once the capture is complete, the blue LED will become steady until the image is saved.
7. How do I reset my PuDCam device to factory settings?
    a. Answer: To reset your PuDCam device, press and hold the reset button (if available) for 10 seconds. Alternatively, you can reset the device through the app settings.
8. What should I do if my PuDCam device becomes unresponsive?
    a. Answer: If your PuDCam device becomes unresponsive, try restarting it by pressing and holding the power button until it powers off. If the issue persists, contact customer support for further assistance.
9. How do I update the firmware on my PuDCam device?
    a. Answer: To update the firmware, connect your PuDCam device to the app and check for updates in the settings menu. Follow the on-screen instructions to install the latest firmware.
10. How do I clean my PuDCam device?

    a. Answer: To clean your PuDCam device, use a soft, dry cloth. Avoid using harsh chemicals or abrasive materials that may damage the device.
11. Can I use my PuDCam device with multiple smartphone?
    a. Answer: Yes, you can use your PuDCam device with multiple devices. Simply pair the device with each device you want to use it with using the app.
12. How do I know if my PuDCam device is compatible with my smartphone?
    a. Answer: Check the compatibility list on the app's website or contact customer support to verify compatibility with your smartphone model.
13. What should I do if my PuDCam device's battery is running low?
    a. Answer: If your PuDCam device's battery is low, recharge it using the provided charging cable. Ensure the device is powered off during charging.
14. How do I change the settings on my PuDCam device?
    a. Answer: To change the settings, open the app and navigate to the settings menu. From there, you can adjust various settings such as brightness, volume, and connectivity options.
15. How do I update the software on my PuDCam device?
    a. Answer: To update the software, connect your PuDCam device to the app and check for updates in the settings menu. Follow the on-screen instructions to install the latest software.
16. How do I enable/disable notifications on my PuDCam device?
    a. Answer: To enable/disable notifications, go to the settings menu in the app and select the notifications option. From there, you can customize your notification preferences.
17. How do I troubleshoot connectivity issues with my PuDCam device?
    a. Answer: If you are experiencing connectivity issues, ensure that Bluetooth is enabled on both your PuDCam device and the device you are trying to connect to. Also, check for any obstacles that may interfere with the Bluetooth signal.
18. How do I reset the Bluetooth settings on my PuDCam device?
    a. Answer: To reset the Bluetooth settings, open the app and navigate to the Bluetooth settings menu. From there, you can choose to reset the Bluetooth settings to their default state.
19. What do I do if my PuDCam device gets wet?
    a. Answer: If your PuDCam device gets wet, immediately power it off and remove the battery if possible. Allow the device to dry completely before attempting to use it again.

4.12.3 Help with Mobile App

The fifth link would be “Help with Mobile app” when clicked would open a new screen which would have a list of the most common questions and their answers. The users would see a list of the most common questions/scenarios and under it would show the answers (below the question or in some other user-friendly way).

The section is editable by the admin on the admin panel, however it should still be available for the user to view offline, essentially it should only update when an internet connection is available.

1. How do I connect my PuDCam device to the app?
    a. Answer: To connect your PuDCam device, ensure Bluetooth is enabled on both your mobile device and the PuDCam device. Open the PuDCam app and follow the on-screen instructions to complete the connection process.
2. How do I use the virtual remote control in the app?
    a. Answer: The virtual remote control in the app allows you to control various functions of your PuDCam device. For example, you can turn the device on/off, capture images, and adjust settings.
3. What does the green LED intensity indicate in the app?
    a. Answer: The green LED intensity in the app indicates the remaining battery level of your PuDCam device. A higher intensity indicates a higher battery level.
4. How do I view the charging status of my PuDCam device in the app?
    a. Answer: To view the charging status, check the second LED indicator in the app. A blinking blue LED indicates that the device is currently charging, while a steady blue LED indicates that the device is fully charged.
5. How do I update the app to the latest version?
    a. Answer: To update the app, go to the app store on your mobile device and check for updates for the PuDCam app. Follow the on-screen instructions to install the latest version.
6. How do I change the language settings in the app?
    a. Answer: To change the language settings, open the app and navigate to the settings menu. From there, you can choose your preferred language for the app.
7. How do I troubleshoot common issues with the app?
    a. Answer: If you encounter issues with the app, refer to the "Troubleshoot" section in the app for step-by-step instructions to resolve common problems.
8. What do I do if the app crashes or becomes unresponsive?
    a. Answer: If the app crashes or becomes unresponsive, try closing the app and reopening it. If the issue persists, restart your mobile device, and try again.
9. How do I view the status of my PuDCam device in the app?
    a. Answer: You can view the status of your PuDCam device, including its connection status and battery level, in the app's main dashboard.
10. How do I access the virtual remote control in the app?
    a. Answer: To access the virtual remote control, open the app and navigate to the remote control section. From there, you can control various functions of your PuDCam device.
11. How do I change the settings of my PuDCam device through the app?
    a. Answer: To change the settings, open the app and navigate to the settings menu.
12. How do I enable/disable notifications from the app?

    a. Answer: To enable/disable notifications, go to the app's settings menu and select the notifications option. From there, you can customize your notification preferences.
13. How do I view captured pupils in the app?
    a. Answer: To view captured pupil images, open the app and navigate to the gallery section. From there, you can view, delete, or share your captured media.
14. How do I update the firmware of my PuDCam device through the app?
    a. Answer: To update the firmware, connect your PuDCam device to the app and check for updates in the settings menu. Follow the on-screen instructions to install the latest firmware.
15. How do I calibrate my PuDCam device through the app?
    a. Answer: To calibrate the device, open the app and navigate to the calibration section. Follow the on-screen instructions to calibrate your PuDCam device.
16. How do I view the user manual/guide in the app?
    a. Answer: To view the user manual/guide, open the app and navigate to the help section. From there, you can access the user manual/guide for your PuDCam device.
17. How do I contact support for further assistance through the app?
    a. Answer: To contact support, go to the app's settings menu and select the support option. From there, you can chat with a support representative or send a message for assistance.
18. How do I view the storage space available on my PuDCam device through the app?
    a. Answer: To view the storage space, open the app and navigate to the storage section. From there, you can view the available storage space on your PuDCam device.
19. How do I customize the LED indicator settings of my PuDCam device through the app?
    a. Answer: To customize the LED indicator settings, open the app and navigate to the LED settings section. From there, you can adjust the LED colors and intensities for different device states.
20. How do I view the capture history of my PuDCam device in the app?
    a. Answer: To view the capture history, open the app and navigate to the history section. From there, you can view a list of all captured images/videos along with their details.

4.12.5 Contact Support

The sixth link would be “Contact support” when clicked would open a new screen with the following links:

- Chat (would link to the Zendesk chatbot)

- Message: when clicked would open a large text box with a send, attach or cancel button. The user should be able to write their message on the text box and attach a picture attachment (only) and click send. The message will have general validations and would allow pictures up to 10 mb to be attached.

4.12.6 Firmware updates:

There would be a large menu button that says “Firmware Update” that when clicked the app would ping the cloud server to check to see if a new firmware version exists and if it does then begin automatically download the firmware from the cloud server to the mobile app.

If a new firmware version was successfully downloaded, then the Pudcam device would be pushed the new firmware version when it’s charging or has battery health above 50% (and the user would be notified of this), if a firmware update is pushed and downloaded on to the device, the device would then begin to install it after internal checks pass and then resets the device to use with the new firmware. During the firmware update process the device would disconnect from the app and the reconnect after resetting. The entire firmware update process should not need the mobile app or the device to be connected to the internet after the new firmware has successfully downloaded.

4.12.7 Disconnect the device:

The user would be able to see the device name, and connection status and if the device is connected, a “Disconnect” button would become active and tappable. Clicking the “Disconnect” button would disconnect the Pudcam device from the app and stop it from all auto connecting until the user clicks the “Connect Device” button (will disable the Bluetooth on the device). There would also be a “Disconnect & Forget” button that when clicked would disconnect the device and make the app forget it (Disable the Bluetooth and remove the currently connected or recently connected device), and the user would have to begin a first time connection with the recently connected or new device after the user taps “Connect Device”.

4.12.8 Device information

This screen would display headings related to device information. The headings would be:

Version information:

Serial number:

Model Name:

Model number:

4.12.9 Device warranty

This screen would have warranty information about the device, the information would be:

Warranty start date and expiry date and a link to extend the warranty. There would also be a support link (with an icon) that when tapped would take the user to the troubleshoot section.

4.12.10 Device support/troubleshoot

When the user taps this link they are taken to the “Help with device” section of the “Troubleshoot” section above.

4.12.11 License information:

Numbers

Any links to pdf and numbers can be added to this screen.

4.12.12 Purchase device

A link to purchase a new Pudcam device

4.12.13 Alerts (in-app pop-ups)

Firmware installation failed

Title: Oops! Firmware Installation Failed.

Text: Something went wrong with the firmware installation. Please retry or contact support for assistance.

Emergency alert sending failed

Title: Emergency Alert Failed to Send.

Text: Your emergency alert could not be sent. Ensure your device is connected and try again.

Battery level is below 20%

Title: Low Battery Alert! Below 20%.

Text: Your PuDCam's battery is running low. Charge it up to continue measuring your pupil dilation.

Image capture failure

Title: Oops! Image Capture Failed.

Text: We couldn't capture the image. Please hold the PUDCAM device still against your eyes and do not blink for at least 3 seconds while capturing the pupil. Please try again.

Reset device failure

Title: Reset Device Failed.

Text: Resetting the device failed. Please try again or contact support for assistance.

Erase data failure

Title: Data Erase Failed.

Text: Erasing data from the device failed. Please retry or contact support for assistance.

Calibrate device failure

Title: Calibration Failed.

Text: Calibration of the device failed. It may be a bad connection or a firmware issue. Please retry or contact support for assistance.

No Firmware Update Found

Title: 🛠 No New Firmware Updates Found

Text: No new firmware update found! Your PuDCam is up-to-date with latest features.

Firmware Update Failed

Title: Firmware Update Failed

Text: Something went wrong with PuDCam firmware update. Please try again.

4.13 Settings

4.13.1 Profile

- Title
- First name
- Last name
- Email address (will need verification if edited)
- Phone number
- DOB using date picker
- Gender by birth*: Male or female drop down
- Origin/Race:
- Profile picture: from library camera roll, or import from Facebook (not mandatory)
- Complete setup (will only be present if first time setup was skipped) and will continue from whichever step the user had left.

4.13.2 Firmware updates

Enable or disable automatic firmware updates

4.13.3 Notifications

The user should be able to enable or disable the below heading notifications in settings, disabling a notification under the heading means they will not receive any of the notifications under that heading.

4.14.2.1 Device/Mobile app usage reminders:

- Enable/disable
- Set when to be received

4.14.2.2 Highlights

- Enable/disable

4.14.2.3 Trends

- Enable/disable

4.14.2.4 Device related

- Enable/disable

4.13.3 Terms and conditions

The screen would have the terms and conditions of the app.

4.13.4 Social accounts

The user will see the icon and links for Twitter (X) and Facebook, that when clicked will allow the user to sign in and connect that social account to the mobile app to allow sharing of data from the Insights section.

4.13.5 Emergency alerts

The user will have the option to:

Enable/disable emergency alerts, if emergency alerts are disabled the option to have emergency contacts below will disappear.

Add/remove/edit emergency contacts, the user can add up to 2 emergency contacts in this section. Each emergency contact would require the name and phone of that contact as a mandatory field.

4.13.6 User feedback and ratings

App store

App store review link, with text: Like the app? Like PuDcam? We'd love your positive feedback, please click this link to leave an app store review, "Leave a review". When the link is clicked the user is taken to the app store review section on the app store to leave a rating and review of the app.

Evon Medics

There should be text that says, "Have something to say about the app?", Please give us a rating from 1-10 and tell us in the text box below what you like and what you dislike in as much detail as possible":

There would be a 1-10 rating radio button option and a large text box to leave a review.

4.13.7 Language

The user can select between English and Spanish, if Spanish is selected then all the text would translate to Spanish on the mobile app and the same goes for English. English will be the default selection.

4.13.8 Remove data (delete data and delete account)

The user will see a link here that says “Delete data” and text that says “All your data from the mobile app will be removed and reset”. When the user clicks this link they will be asked “Are you sure, you want to delete all your app data?” If they tap yes, then a pop-up asks them if they’d like to delete their “User data” and “Profile” with a check box next to each option, the user can check or un-check “User data” however if the user checks “Profile” then “User data” will also be checked and it will not be uncheckable.

After the user selects these options and taps “OK”. Then a pop-up asks for their current password after the password is entered successfully, an SMS is sent to their phone with a verification code and a pop-up is shown that says “An SMS has been sent to the registered phone number with a one-time passcode, please enter it below to continue” and the user must enter the code sent to their phone, if the code is entered successfully, the data deletion process begins and the user is shown a progress bar, after successful deletion if the user selected just “User data” then they are brought to their default screen but any previously recorded data (readings, trends, highlights) would no longer be there at all.

If the user selected “Profile” (which means they also selected “User data”) they are logged out and taken to the sign-in/sign up screen and all their data is deleted.

If they sign-in with their credentials, they are then taken to the first-time setup screens to enter their information.

After successfully signing in or (just landing on the default screen f they just deleted “User data”), if the user goes in to settings and returns to the “remove data” menu within 30 days they’ll see an option link that says “Recover my user data and profile” if clicked, and there is some new data on the mobile app the user is asked to confirm in a pop-up “There’s some data since deletion occurred, would you like to:? “Merge with current data” button or “Replace current data” button, the user must make a selection.

If there was no new data then the user does not see this pop-up and goes to confirm in a pop-up (also after making a merge or replacement selection) “Are you sure you want to recover your account?” if the user clicks “OK” Then a pop-up asks for their current password after the password is entered successfully, an SMS is sent to their phone with a verification code and a pop-up is shown that says “An SMS has been sent to the registered phone number with a one-time passcode, please enter it below to continue” and the user must enter the code sent to their phone, if the code is entered successfully, the data recovery process begins and the user is show a progress bar, once complete the user is brought to the sign-in/sign up screen. The user can sign-in and they should be able to see the data they restored according to the selection they made. If replacement was selected then all of their current data should have been replaced, and if merge was selected any current data would have been merged with the recovered data.

In the mobile app under settings under “Remove Data: the user will also see a “Delete account” link with an explanation that your account plus all your data from the mobile app will be removed and reset. When the user clicks this link they are asked are you sure, you want to delete your account? If they say yes, then a pop-up asks for their current password after the password is entered successfully, an SMS is sent to their phone with a verification code and a pop-up is shown that says “An SMS has been sent to the registered phone number with a one-time passcode, please enter it below to continue” and the user must enter the code sent to their phone, if the code is entered successfully, the account deletion process begins and the user is show a progress bar, after deletion they are logged out and taken to the sign-in/sign up screen.

4.13.8.1 Errors (In-app alerts)

- Data Deletion Confirmation:
    - Pop-up Title: Data Deletion Confirmation
    - Pop-up Text: Are you sure you want to delete all data from your PudCam device? This action cannot be undone.
- Data Deletion Progress:
    - Pop-up Title: Data Deletion in Progress
    - Pop-up Text: Your PudCam device's data is being deleted. Please wait while the process completes.
- Data Deletion Success:
    - Pop-up Title: Data Deletion Complete
    - Pop-up Text: All data on your PudCam device has been successfully deleted.

4.13.9 Siri shortcuts (and any Android equivalent)

Siri shortcut to “Re-connect with Pudcam” device

Siri shortcut to “Battery health” of the Pudcam device

Siri shortcut to "PuDCam Capture Pupils": This shortcut could automatically launch the PuDCam app and initiate the process of capturing pupils. This shortcut could trigger the PuDCam device to capture an image without the need to manually press the capture button.

Siri shortcut to "Check Device Status": This shortcut could provide a summary of the current status of the PuDCam device, including battery level, connectivity status, and any pending notifications.

Siri shortcut to "View Last Image Captured": This shortcut could open the PuDCam app and display the last image captured by the device for quick review.

4.13.10 Logout

Clicking the logout will bring up a pop-up to ask “Are you sure you want to log out of the mobile app” if “Yes” is tapped the user is logged out and if “No” is tapped the pop-up disappears and nothing happens.

4.14 Notifications

4.14.1 Screen

This screen would show all the unread notifications to the user in the form of cards (similar to the Dashboard screen), the same card format of notifications would be displayed here and all the unread notifications would be listed here. After the user opens this screen all the notifications would be marked as read. All unread notifications would be displayed here but only the last 10 read notifications would stay, all read notifications would be removed when new unread notifications are added. When the user clicks on a notification they are taken to that section of the app if relevant, otherwise they are taken to the “Dashboard” screen. The user would receive an app badge and banner when a notification is sent outside of the app.

4.14.2 Notification Text

4.14.2.1 Sign up/ Sign–in

1. If the user has downloaded the app but not signed up or completed sign-up, they would get the following notification:

Notify once every 2nd day at 7:30 PM local user time

Title: ⏳ Don't Miss Out! Sign Up Now!

Text: Signing up on the mobile app enables you to pair your PuDCam device, view pupil images and track your daily pupil measurements.

2. If the user has completed sign-up but not completed first-time setup, they would get the following notification:

Notify once every day at 7:30 local user time

Title: 🚀 Ready to Dive In? Complete Setup!

Text: Time to get started with PuDCam! Complete the first-time setup to get recommended ranges for your pupil dilation and many more.

Priority level: High

4.14.2.2 Device/Mobile app usage reminders

1. If the user is new and they haven't been doing any readings, they should get the following notification:

Title: 📨 Let's Get Started with a pupil measurement, Shall We?

Text: A new PuDCam device can capture your eye health journey! Take your first reading today and embark on a clear vision quest.

Priority level: High

Frequency: Notify every 24 hours until they do their first reading, reset when a reading is taken.

2. If the mobile app receives a new images or images, the user should get the following notification:

Frequency: Notify instantly once, reset when the app is opened.

Title: 📸 Snap! New Pupil Images Await You!

Text: PuDCam has captured your pupils. Track your eye health progress.

Priority level: Medium

4. If the user is not doing any reading per day, they should get the following notification:

Title: 👀 Time to Shine! Your Pupils Await Your Attention.

Text: <Dynamic text>

Priority level: High

Conditions:

1. If they have a data trend the text should highlight the trend and notify them to do more readings to complete the trend.

Text: Well done! You're on a streak. Capture more to build your pupil profile.

Frequency: Notify every 24 hours until they do 2 or more. reset the cycle when a reading is taken.

3. If the user missed doing their reading by 3 hours or after their average time (for each day), the should get the following notification:

Title: ⏰ Oops, Missed a pupil visual? Let's Catch Up!

Text: Hola! Looks like you missed your pupil capture today! Don't worry, PuDCam's got your pupillary health.

Priority level: Medium

Frequency: Instantly, reset the cycle when a reading is taken.

4. If its been 48 hours and the user has not been doing readings then the following notification would be sent out:

Title: 🕳 Alert! Your Pupils Need Some Love.

Text: You missed recording pupils, daytime and night-time, for the last 48 hours. Ready to capture your pupils today?

Priority level:

Frequency: Stop notification 4 above, every 24 hours for the first 4 days and then every 48 hours for 3 times and then once every 5 days twice and then stop. Restart this cycle when the next reading is taken.

4.14.2.3 Highlights

All highlights will also be notifications, defined below:

Increase of pupil dilation percentage over 3 days or more:

Title: 📈 Attention! Decrease in Pupil Dilation

Text: Your pupil dilation has increased over the last 3 days. Keep an eye on changes in your eye health.

Priority level: High

Frequency: Instant

Decrease of pupil dilation percentage of 3 days or more.

Title: 📉 Attention! Decrease in Pupil Dilation

Text: Your pupil dilation has decreased over the last 3 days. Keep an eye on changes in your eye health.

Priority level: High

Frequency: Instant

Streak of data recording of 3 readings

Title: 🏅 Streak Alert! 3 Readings Recorded

Text: Hurray! You've recorded a streak of 3 readings. Consistency is the key to better understanding your pupils and underlying differentiators.

Priority level: Medium

Frequency: Instant

Streak of data recording of 3 or more for night time

Title: 🏅 Moon Streak Alert! 3 night time Readings Recorded

Text: Hurray! You've recorded a streak of 3 night time readings. Keep it up!

Priority level: Medium

Frequency: Instant

Streak of data recording of 3 or more for day time

Title: 🏅 Sun Streak Alert! 3 day time Readings Recorded

Text: Hurray! You've recorded a streak of 3 night time readings. Keep it up!

Priority level: Medium

Frequency: Instant

4.14.2.4 Trends

If the reading is 50% below the average pupil dilation then:

Title: 🕳️ Dive Deep! Pupil Dilation Below Average

Text: Your pupil dilation is 50% below average daily reading. An eye examination or consultation with an ophthalmologist is recommended.

Frequency: Instant

If the reading is 50% above the average pupil dilation then:

Title: 🚀 Sky High! Pupil Dilation Above Average

Text: Your pupil dilation is 50% above your average. Increased Dilation can be indicative of several neurological conditions. Please consult a physician for safety.

Frequency: Instant

4.14.2.5 Device

Success

Device Bluetooth connection successful

Title: 🎉 Connected! Your PuDCam is Ready!

Text: Your PuDCam is now connected via Bluetooth. Let the eye health journey begin!

Frequency: Instant

Firmware installation successful

Title: 🚀 Firmware Update Complete!

Text: Your PuDCam's firmware has been successfully updated. Enjoy the latest features and improvements!

Frequency: Instant

Battery charging is complete

Title: 🔋 Fully Charged and Ready to Go!

Text: Your PuDCam's battery is fully charged. Unplug and explore the world of eye health with a full charge!

Frequency: Instant

Failure

Unable to find device with Bluetooth switched on

Title: 📡 Lost Connection! Device Not Found.

Text: Oops! We couldn't find your PuDCam. Please check and try again.

Frequency: Instant

Bluetooth switched off

Title: 📴 Disconnected! Bluetooth Switched Off.

Text: Your PuDCam's Bluetooth is switched off. Please switch it on to connect and monitor your pupil sizes.

Frequency: Instant

Bluetooth disconnected

- Process active

  Title: 🔍 Searching... Bluetooth Disconnected.

  Text: Hold on! We're actively searching for your PuDCam. Keep your eyes peeled for a connection soon.

  Frequency: Instant

- Process inactive

  Title: ❌ Connection Lost! Bluetooth Inactive.

  Text: We're unable to establish a connection with your PuDCam. Please check the device and try again.

  Frequency: Instant

Firmware installation failed

Title: 🛠️ Oops! Firmware Installation Failed.

Text: Something went wrong with the firmware installation. Please retry or contact support for assistance.

Frequency: Instant

Emergency alert sending failed

Title: 🚨 Emergency Alert Failed to Send.

Text: Your emergency alert could not be sent. Ensure your device is connected and try again.

Frequency: Instant

Battery level is below 20%

Title: ⚡ Low Battery Alert! Below 20%.

Text: Your PuDCam's battery is running low. Charge it up to continue measuring your pupil dilation.

Frequency: Instant

Image capture failure

Title: 📸 Oops! Image Capture Failed.

Text: We couldn't capture the image. Please hold the PUDCAM device still against your eyes and do not blink for at least 3 seconds while capturing the pupil. Please try again.

Frequency: Instant

Reset device failure

Title: 🔒 Reset Device Failed.

Text: Resetting the device failed. Please try again or contact support for assistance.

Frequency: Instant

Erase data failure

Title: 🗑️ Data Erase Failed.

Text: Erasing data from the device failed. Please retry or contact support for assistance.

Frequency: Instant

Calibrate device failure

Title: 🎯 Calibration Failed.

Text: Calibration of the device failed. It may be a bad connection or a firmware issue. Please retry or contact support for assistance.

Frequency: Instant

4.15 Analytics

The mobile apps will integrate with Google analytics to track all events that define, user behavior, app performance and measure the effectiveness of features.

The below metrics would be needed from Google analytics:

User Acquisition:

- App Installs: Total number of times the app has been installed.
- App Store Impressions: How many times your app listing is viewed in the app store.
- App Store Conversion Rate: Percentage of app store visitors who install your app.
- Source of Installs: Which channels (organic, paid, referrals) are driving installs.
- Signed up users (sign up and first-time profile setup as well)

User Engagement:

- Daily Active Users (DAU): Number of unique users who open the app each day.
- Monthly Active Users (MAU): Number of unique users who open the app each month.
- Stickiness: DAU divided by MAU, indicating how often users return to the app.
- Session Length: Average time users spend in the app per session.
- Session Interval: Time between consecutive app sessions for a user.
- Screen Flow: The path users take through the app, showing popular and drop-off points.
- Account deletion

Retention:

- Retention Rate: Percentage of users who return to the app after installing it.
- Churn Rate: Percentage of users who stop using the app over a period of time.
- Retention Cohorts: Tracking retention for groups of users who started using the app at the same time.

User Behavior:

- Screen Views: Number of times each screen in the app is viewed.

- Feature Usage: Which features of the app are being used the most.
- Events: Custom events tracked in the app (e.g., purchases, shares, likes).
- App Crashes: Frequency and causes of app crashes.

App Performance:

- Load Time: How long it takes for the app to load.
- Response Time: How quickly the app responds to user interactions.
- Error Rates: Frequency of errors encountered by users.

Geographic and Demographic Data:

- Device: Which devices and operating systems are being used.
- User Characteristics: Age, gender, interests, etc.

Benchmarking:

- Industry Comparisons: Comparing your app's performance metrics with industry benchmarks.

Screen views:

- Which screen has the highest screen views
- Which screen has the lowest screen views
- Screen view numbers for each screen

4.16 Performance monitoring

The mobile apps will integrate with Crashlytics for performance monitoring.

5. Functional hierarchy of the admin panel

- Sign-in
    - Forgot Password
- User Management
- Manage notifications
- Data Management
- Content Management
- Analytics
- Performance monitoring
- Support ticket management
- FAQ management

6. Functional details of the admin panel

Appmaisters will provide username and password for 3 admins, user management for admins is out of scope for this engagement.

6.1 Sign-In:

The first time, the admin member would login by entering their email address and password received via email from Appmaisters. If the login credentials are correct, they would be able to login to the web app successfully. If the login credentials are incorrect an error message will appear saying invalid username or password.

After authentication, the member will be redirected to the screen where they can set up a new password.

They will be prompted to set up a unique and strong password, which should be twelve characters long, has no predictable pattern and contains a mixture of numbers, special characters and both uppercase and lowercase letters. Then the member will be take to the login screen to login with their new credentials.

6.1.1 Forgot Password

Upon tapping this link, a 6-digit code will be generated and sent to the member's email address. The member has to enter the code on the screen and submit it. After authentication, the member will be redirected to the screen where they can set up a new password.

They will be prompted to set up a unique and strong password, which should be twelve characters long, has no predictable pattern and contains a mixture of numbers, special characters and both uppercase and lowercase letters.

6.2 User Management

This page will list all the (mobile app) users and technicians in a table with their name, email address, the date the user or technician was added, user role (user or technician) a button to disable/enable them, a button to reset their password (the password would reset and new one would be sent) and a button to remove them. The admin can filter between users and technicians.

Invite: A member can invite technicians only by clicking on the “Invite” button, a pop-up will come up asking for the user’s first name, last name and email address. Users cannot be invited.

Pending list: A member can view invited technicians who have not yet accepted by clicking on “Pending list” button and see a list of members who have not yet logged in for the first time. The admin can also delete those invitations from the list and the technician will then not be able to login unless they’re sent a new invitation and they login with their new password. Admin’s can also resend the same invitation to a pending technician.

Search: A search box will allow for the user or technician to be searched by their full name or email address, the results will display the user in the table with the above options.

6.3 Manage Notifications

The admin could send manual notifications to mobile app users here; there would be the following fields that would define the notification to be sent out.

There would be a “Title:” label with a textbox next to it, that would be limited to 50 characters, where the title of the notification will be defined, any text entered here would be the title of the notification that is sent out.

There would be a “Text:” label with a textbox next to it, that would be limited to about 178 characters, any text entered would be the body of the notification that is sent out.

There would be a “Priority” label with a dropdown next to it, with the options, low, medium and high which would allow the admin to choose a priority of that notification for the mobile app.

Then there would be a “Send” button and if a title, text and priority level have been entered successfully, the notification will be sent to all signed up mobile app users, otherwise an error message will display with red text telling the user the mistake that they made. Once the notification is sent successfully the admin would be notified that it was sent successfully.

6.4 Data management

This screen would be titled data management and would have a table with all the mobile app users with their name, email address, and the date the user signed up.

When the admin clicks on a user, they are then taken to the user’s view which has their reading data all in a table, by default there would be their previous 30 readings with the column names, date, time, pupil dilation AI ML version, app version, night time or day time. The normal range legend would be on this screen. The ability to filter by days, by using a date picker from the day the first reading was recorded until today. The ability to export this data in a PDF or CSV format. And the ability to view, 100 to 200 readings on the table.

6.5 Content Management

The admin user should have the option to edit some sections of the content on the mobile app, the sections below should be editable:

User guide

Setup hardware (4.4.2 Step 2: Setup the hardware): This will be screens with images and text explaining the setup of the hardware, the admin should have the option to add, edit or delete images and text from these screens using a rich text editor. When the admin clicks “Submit” the new content should update on the corresponding.

Step App and Hardware (Guided process to setup the app and the hardware integration): This will be screens with images and text explaining the setup of the app and the integration with the device, the admin should have the option to add, edit or delete images and text from these screens using a rich text editor.

App help (4.8.3 HELP with APP): These will be FAQ questions and answers as defined above the admin should have the option to edit, add or delete the text on these screens using a rich text editor.

Device help (4.8.4.2 Help with Device:) These will be FAQ questions and answers as defined above the admin should have the option to edit, add or delete the text on these screens using a rich text editor.

Education

This section would allow the updating of the "Education" section screens and any text and images that are on those screens.

Science behind Pudcam (4.7.1 Science behind Pudcam): This will be a screen with text explaining the heading in detail, there should be a rich text editor that allows adding, editing and updating the content on this screen.

Relevance to light (4.7.2 Relevance to light): This will be a screen with text explaining the heading in detail, there should be a rich text editor that allows adding, editing and updating the content on this screen.

Deviation in my results (4.7.3 Deviations in my results): This will be a screen with text explaining the heading in detail, there should be a rich text editor that allows adding, editing and updating the content on this screen.

What's a normal range for me? (4.7.4 What's a normal range for me): This will be a screen with text explaining the heading in detail, there should be a rich text editor that allows adding, editing and updating the content on this screen.

Terms and conditions and privacy policy to be managed manually as part of maintenance to stay within app store guidelines.

6.6 Analytics

The mobile apps will integrate with Google analytics to track all events that define, user behavior, app performance and measure the effectiveness of features.

The below metrics would be needed from Google analytics:

User Acquisition:

- App Installs: Total number of times the app has been installed.
- App Store Impressions: How many times your app listing is viewed in the app store.
- App Store Conversion Rate: Percentage of app store visitors who install your app.
- Source of Installs: Which channels (organic, paid, referrals) are driving installs.
- Signed up users (sign up and first time profile setup as well)

User Engagement:

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- Stickiness: DAU divided by MAU, indicating how often users return to the app.
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- Session Interval: Time between consecutive app sessions for a user.
- Screen Flow: The path users take through the app, showing popular and drop-off points.
- Account deletion

Retention:

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- Retention Cohorts: Tracking retention for groups of users who started using the app at the same time.

User Behavior:

- Screen Views: Number of times each screen in the app is viewed.
- Feature Usage: Which features of the app are being used the most.
- Events: Custom events tracked in the app (e.g., purchases, shares, likes).
- App Crashes: Frequency and causes of app crashes.

App Performance:

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- Error Rates: Frequency of errors encountered by users.

Geographic and Demographic Data:

- Device: Which devices and operating systems are being used.
- User Characteristics: Age, gender, interests, etc.

Benchmarking:

- Industry Comparisons: Comparing your app's performance metrics with industry benchmarks.

Screen views:

- Which screen has the highest screen views
- Which screen has the lowest screen views
- Screen view numbers for each screen

6.7 Performance Monitoring

The mobile apps would integrate with Crashlytics to identify crashes, issues and logs that enable fixing and resolving of issues incurred by the mobile apps.

Firebase and Crashlytics will be implemented to enable the above.

If notifications can be assigned to notify the administrators via email for every crash.

6.8 Support Ticket Management

- Assist users with calibrating the hardware device
- Connect with users through chat to address the raised ticket
- Assist users by gaining control access to their app
- View a list of all or user-specific pending and completed ticket requests
- Submit and track support tickets for technical issues users encounter.

6.9 FAQ Management

Already covered in the “content management” user guide and app help section above.

7. Functional hierarchy of the technician web panel

- Sign-in
  - Forgot Password
- User Management
- Support ticket management via Zendesk
  - Remote diagnostics
- Knowledge base

8. Functional details of the technician web panel

An admin will add technicians with their name and email address, an invitation email will go out to the technicians email address with their username and password.

8.1 Sign-In:

The first time, the admin member would login by entering their email address and password received via email from the super admin. If the login credentials are correct, they would be able to login to the web app successfully. If the login credentials are incorrect an error message will appear saying invalid username or password.

After authentication, the member will be redirected to the screen where they can set up a new password.

They will be prompted to set up a unique and strong password, which should be twelve characters long, has no predictable pattern and contains a mixture of numbers, special characters and both uppercase and lowercase letters. Then the member will be take to the login screen to login with their new credentials.

8.1.1 Forgot Password

Upon tapping this link, a 6-digit code will be generated and sent to the member's email address. The member has to enter the code on the screen and submit it. After authentication, the member will be redirected to the screen where they can set up a new password.

They will be prompted to set up a unique and strong password, which should be twelve characters long, has no predictable pattern and contains a mixture of numbers, special characters and both uppercase and lowercase letters.

8.2 User Management

This page will list all the (mobile app) users in a table with their name, email address, the date the user was added, a button to Disable/Enable them, a button to reset their password (the password would reset and new one would be sent) and a button to remove them.

Search: A search box will allow for the user or technician to be searched by their full name or email address, the results will display the user in the table with the above options.

8.3 Support Ticket Management

- Assist users with calibrating the hardware device
- Connect with users through chat to address the raised ticket
- Assist users by gaining control access to their app
- View a list of all or user-specific pending and completed ticket requests
- Submit and track support tickets for technical issues users encounter.

8.4 Knowledge base

The technician will see a wiki like page of the links below and any content screen will open in full when a link is clicked.

User guide

Setup hardware (4.4.2 Step 2: Setup the hardware): This will be screens with images and text explaining the setup of the hardware, the admin should have the option to add, edit or delete images and text from these screens using a rich text editor. When the admin clicks “Submit” the new content should update on the corresponding.

Step App and Hardware (Guided process to setup the app and the hardware integration): This will be screens with images and text explaining the setup of the app and the integration with the device, the admin should have the option to add, edit or delete images and text from these screens using a rich text editor.

App help (4.8.3 HELP with APP): These will be FAQ questions and answers as defined above the admin should have the option to edit, add or delete the text on these screens using a rich text editor.

Device help (4.8.4.2 Help with Device:) These will be FAQ questions and answers as defined above the admin should have the option to edit, add or delete the text on these screens using a rich text editor.

Education

This section would allow the updating of the "Education" section screens and any text and images that are on those screens.

Science behind Pudcam (4.7.1 Science behind Pudcam): This will be a screen with text explaining the heading in detail, there should be a rich text editor that allows adding, editing and updating the content on this screen.

Relevance to light (4.7.2 Relevance to light): This will be a screen with text explaining the heading in detail, there should be a rich text editor that allows adding, editing and updating the content on this screen.

Deviation in my results (4.7.3 Deviations in my results): This will be a screen with text explaining the heading in detail, there should be a rich text editor that allows adding, editing and updating the content on this screen.

What's a normal range for me? (4.7.4 What's a normal range for me): This will be a screen with text explaining the heading in detail, there should be a rich text editor that allows adding, editing and updating the content on this screen.

9. Non-Functional requirements

9.1 Data storage and encryption

The app follows best practices for data storage, ensuring user information is secure and accessible. Data is stored in the following manner:

User Profiles: Basic user information, including name, email, and profile picture, is stored securely on the device and encrypted using industry-standard encryption algorithms. Additionally, user profiles may be synced with cloud storage for backup and synchronization across devices, following stringent security protocols.

Pupil Measurement Data: Raw diagnostic-quality IR images of the pupil, as well as processed pupil dilation measurements, are stored securely on the device and encrypted to prevent unauthorized

access. Cloud storage may be used for backup and long-term storage, with data transmission protected by secure encryption protocols.

Progress Reports: Graphs and charts tracking pupil size changes over time are stored locally on the device and may be synchronized with cloud storage for backup and accessibility across devices. Data access is controlled through secure authentication mechanisms to protect user privacy.

Historical Measurement Data: Users' historical measurement data is stored securely on the device and may be backed up to the cloud for long-term storage. Access to historical data on the cloud is restricted to admin and technicians, with data transmission protected by encryption protocols.

9.2 Data Access:

o *Local Storage (included in offline capability):* Data stored locally on the device is accessed using secure file access methods provided by the operating system, with encryption used to protect data integrity. In case of no internet connectivity, data can be retained in the local storage and later transferred to the cloud storage for backup and web access.

o *Cloud Storage:* Access to cloud-stored data is managed through secure APIs provided by the cloud storage provider. User authentication and authorization are required to access cloud data, with data transmission protected by industry-standard encryption protocols.

9.3 Data Security:

o *Encryption:* All stored data, both locally and in the cloud, is encrypted using strong encryption algorithms to prevent unauthorized access.

o *Access Controls:* Access to stored data is restricted to authorized users only, with user authentication and authorization mechanisms in place to ensure data security. User Auth mechanisms: Username and Password via 0Auth2.0

o *Compliance:* The app complies with relevant data protection regulations, such as GDPR, CCPA, and ADA level A compliances, to ensure user data is handled following legal requirements. User consent is obtained for data processing and storage, and users have the right to access and delete their data as per regulations.

9.4 Mobile SDK Development:

App Maisters agrees to develop a custom Software Development Kit (SDK) for the mobile app of the PuDCam hardware at no additional cost to Evon Medics LLC. The SDK will integrate with any firmware provided for the device. Any support relating to developing new libraries required from Evon Medics by App Maisters to develop the SDK will be provided within a timely manner.

9.5 CI/CD Pipelines:

9.5.1 AI weight file update:

When the AI model gets updated with new weighted files and a new Github release is available, then this release should trigger an automated publishing of the AI model on to the Admin panel, and the admins should get an option to Approve or Deny. If they click “Approve” the new AI weight files version would get uploaded to the live AI weight cloud server, and now when the user opens the mobile app after 24 hours it would ping the cloud server which would tell the app that a new AI weight file is available. And then the AI file would begin downloading to update the AI weight file on the mobile app.

9.5.2 Firmware file update:

When the firmware gets updated and a new Github release is available, then this release should trigger an automated publishing of the firmware on to the Admin panel, and the admins should get an option to Approve or Deny it. If they click “Approve” the new firmware files version would get uploaded to the live firmware cloud server, and now if the user has automatic updates switched on and opens the mobile app after 24 hours it would ping the cloud server which would tell the app that a new firmware version is available. And then the firmware would begin downloading to update the firmware on the mobile app.

9.6 AI-Model Deployment on Mobile App:

- Evon Medics will provide the latest version of AI-Model weight files.
- The App Maisters team will assess the need to optimize the AI model for mobile.
    - Study existing model architecture
    - Baseline Evaluation of the Current Model
    - Image data retrieval and preprocessing
    - Iterative training and optimization
    - Testing
    - Convert to a mobile-compatible model
- The App Maisters team will deploy the mobile-optimized AI-model weight to the mobile app, stored locally for on-device image diagnostic and diagnosis processing.
- This system will feature an automatic weight file update mechanism on the mobile app.

9.7 AI Model Optimization and Deployment:

AI Model Modification, Optimization, and Deployment: App Maisters will modify, optimize, train with latest data to support the mobile app and deploy the latest AI model for the PuDCam

project. This will involve fine-tuning the AI model to meet Evon Medics' specific requirements and integrating it seamlessly into the PuDCam application.

10. App store Listing

The mobile apps listing will be app store optimized because Appmaisters will implement strategies to improve the app's visibility and ranking in the app stores, such as keyword optimization and A/B testing of app store listings.

Note – App Maisters will perform this action one-time only at the time of deployment and will provide training to a point of contact within Evon Medics to perform this effort.

Note:

This SOW supersedes “Exhibit A” of the MSA.

Signature: Charles Nwaokobia
Charles Nwaokobia (May 15, 2024 21:31 EDT)

Name: Charles Nwaokobia

Company Name: Evon Medics LLC

Title: _____COO/President_____

May 15, 2024

PuDCaM_SOW

Final Audit Report 2024-05-16

Created:	2024-05-13
By:	Sales App Maisters (salesteam@appmaisters.com)
Status:	Signed
Transaction ID:	CBJCHBCAABAAADFUuutCFW3cg4INFvIjKIYJubzB0Ja8

"PuDCaM_SOW" History

Document created by Sales App Maisters (salesteam@appmaisters.com)
2024-05-13 - 10:26:33 PM GMT- IP address: 103.24.99.82

Document emailed to Charles Nwaokobia (cnwaokobia@evonmedics.org) for signature
2024-05-13 - 10:29:10 PM GMT

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